DOCUMENT RESUME

ED 171 348 JC 790 352

AUTHOR St. John, Edward P.
TITLE MIS Development in Higher Education: A Framework for Systems Planning.
PUB DATE May 79
NOTE 27p.; Paper presented at the Annual Conference of the Association of Institutional Research (19th, San Diego, California, May 13-17, 1979)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Oriented Programs; Data Processing; Educational Planning; Information Processing; Information Utilization; Institutional Research; *Management Information Systems; *Management Systems; *Models; Needs Assessment; Postsecondary Education; School Surveys; *State Surveys; Systems Analysis; Systems Concepts
IDENTIFIERS Missouri

ABSTRACT

An institutional management systems development study examined the Management Information Systems (MIS) needs of 23 public institutions of higher education in Missouri. The result was a model framework for other institutions to develop MIS appropriate to their needs. One of five distinct structural development phases could be related to all Missouri colleges and universities; these provided the basis for determining MIS needs of each group of institutions examined. In this study report, Table I outlines a general MIS model with each of the five phases of an intervention model matrixed for planning, management, evaluation, and inquiring systems. Table II presents four possible indicators of structural development which can be used to predict developmental phases. Table III summarizes the results of an MIS development survey in Missouri's 23 institutions including (1) the applicability of MIS systems; (2) appropriate computer environment; (3) MIS development priorities; (4) factors limiting MIS implementation; and (5) factors encouraging MIS information. Each aspect of the tables is discussed. The results of this analysis suggest that a differentiated approach to the task of MIS development is needed in higher education and that systems design should be considered within the context of the overall management needs of an institution. (RC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED171348

MIS DEVELOPMENT IN HIGHER EDUCATION:

A FRAMEWORK FOR SYSTEMS PLANNING

by
Edward P. St. John
Associate Director of
Research and Planning,
Missouri Department of Higher Education
600 Monroe
Jefferson City, MO 65101
(314) 751-2361

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Edward St. John

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

JC 790 352

to be presented at
Association of Institutional Research
Annual Conference
May, 1979

MIS DEVELOPMENT IN HIGHER EDUCATION:
A FRAMEWORK FOR SYSTEMS PLANNING

Abstract

Management Information Systems (MIS) have become an important part of the overall management systems for all colleges and universities. The technological revolution in the information processing industry has made MIS computerization relevant to most institutions. There is, however, an absence of a framework to guide planning in this area. This paper proposes such a framework. It argues that more sophisticated MIS are needed by larger and more complex institutions, while more modest systems are appropriate for small- and medium-sized institutions. It is derived from a general management-development model that considers information needs as an integral part of the overall planning, managerial, and evaluation system. Five plateaus of MIS development are proposed that take into account the applicability of automated systems, the appropriate computer environment, MIS development priorities, and factors limiting MIS development.

MIS DEVELOPMENT IN HIGHER EDUCATION:
A FRAMEWORK FOR SYSTEMS PLANNING

The information revolution brought about by rapid and recent developments in computer technology, including the availability of less expensive computer hardware has left college and university administrators with some difficult decisions about the uses of automated management information systems. Unfortunately the efficiencies, costs, and appropriateness of management information system (MIS) development and automation are not well understood.

This paper proposes and develops a framework to help guide administrator's decisions about and planning for MIS development and automation. It takes into account the institutional size and complexity, internal management needs, and the relationship between MIS development other institutional planning, managerial, and evaluation (PME) systems. The assumptions on which the framework is based are as follows:

1) The basic pattern of MIS computerization costs into and perhaps through the 1980's is already well established. The costs of computerization can be expected to remain relatively constant (adjusting, of course, for inflation), because hardware costs are decreasing, while personnel and software costs, including systems development, are increasing (Emery, 1978). The net effect is that the increasing availability of low-cost computer hardware will be

off-set by the increasing personnel and software costs associated with automation.

2) The design of Management Information Systems should take into account the internal management needs of the institution. Information system development, to be effectively implemented and utilized, must be approached within a context that considers other institutional management systems, especially the planning, managerial and evaluation systems operating at the institution.

3) The characteristics of an institution, especially its size, complexity, and history are critical factors in determining management needs. It is argued that the larger and more complex the institution, the more sophisticated its management needs are likely to be.

4) There is no "one best" or "most appropriate" management or information system for all institutions. Instead, the internal needs of the institution dictate the degree to which PME and MIS developments are needed; the need for more sophisticated systems is often an outgrowth of the successful implementation of less sophisticated systems. Therefore, systems development and modification should be viewed as a fluid process with future needs determined to a large degree by past developments.

Two research steps were used to develop the MIS development framework. First, a general management development model, derived from the literature industrial and educational management was tested and elaborated on

by examining in-depth case studies of management development efforts at a few institutions funded by the Developing Institutions Program, part of Title III of the HEA. Second, using a set of quantitative indicators for phases of structural development proposed in the first study, the public higher education institutions in Missouri were grouped into five distinct developmental phases and the MIS needs of each group of institutions were examined.

I. The General Model

The model was derived from theories of industrial organization and management (Chandler, 1962; Greiner, 1972; and Massie, 1965). Traditional management theory has included both formal organization structure and the general process of management (Massie, 1965). Some theorists argue that changes in the formal organization structure and changes in the appropriateness of different management practices are closely tied, and that the formal structure, to a large degree, determines the types of practices that should be implemented at a given time (Chandler, 1962; Greiner, 1972). This approach is particularly relevant to the study of college and university management (Balderston, 1974; St. John and Weathersby, 1977; and Weathersby, 1975).

Based on an in-depth examination of several case studies (St. John, 1977) a general model of structural development was identified. Structural development is associated with, although not synonymous with, increased size and complexity. As colleges develop structurally distinctively different organizational forms emerge, building on the characteristics of the prior phases. During the initial phase, the structure is simple:

the faculty and student body is small; the college is usually run by one or two key administrators; and the developmental focus is on creating academic programs. If the institution continues to grow and thus enters the second phase, the administration becomes more formalized, some differentiation of administrative and academic functions occurs, and the focus of tne organization shifts to program maintenance and to defining the long-range direction of the organization. During the third phase, existing functions, perhaps added during the second phase, are formalized into organizational subunits and new functional subunits--schools, colleges, or campuses--may be added to the organization. The fourth phase is the last phase for which there was evidence in the case studies. During this phase, the developmental focus shifts to centralized administrative services to coordinate the activities of diverse functional subunits.

Originally a fifth phase was also proposed. It was argued that during this most complex organizational phase new organizational arrangements, such as matrix management, would be implemented. Although there were no examples of phase V contained in the case studies used to develop the model, there are examples of more complex organization structures in higher education in the United States. According to the hypothesized model, in the collaboration phase, representatives from central administrative units and functional subunits work out new collaborative arrangements for creating and managing programs. The way some university systems have implemented open or extended campuses illustrates this management approach (Lee and Bowen, 1975).

Management Interventions: The analysis of case studies also revealed a dynamic relationship between structural development and institutional management needs. Table I presents a brief summary of the management systems we can reasonably expect to find at institutions in the first five developmental phases.

Based on the analysis of case studies and the intervention programs at these institutions, it is possible to suggest a general model for interventions designed to improve institutional management. The general concept of an institutional management system is broken-down into four components: planning, managerial, evaluation, and inquiring systems. These components are defined as follows: planning systems refer to procedures for systematic institutional and program planning; managerial systems refer to day-to-day decision systems; evaluation systems refer to systems for evaluating progress toward planned outcomes; and inquiring systems refer to the data bases and information retrieval systems used by the other three systems. All of the institutions included in the original study were funded to undertake development efforts in these areas. Consequently all of the case institutions had experimented with these management components. Combined, these four components of an institutional-management system suggest a useful scheme for systematically categorizing institutional-management needs.

According to the model, each subsequent management development builds on the developments needed in the prior phase; each is added to the capacities developed in prior phases. In practice, attaining balance in the phase of structural development and the institutional-managements system is a difficult task. It is very likely that one or another component of a campus management system may be underdeveloped.

TABLE I

Intervention Model: Development Matrix for Planning, Management, Evaluation, and Inquiring Systems

	Planning	Managerial	Evaluation	Inquiring
I. Creation	Short-range program planning	Informal-Collaborative interaction, task oriented management	Market studies, supply-demand studies, knowledge of educational trends	Informal, interpersonal judgmental, consensual
II. Direction	Add: Long-range planning capacity	Add: Formal systems for maintaining existing programs	Add: Assessment of program impact, students/ faculty attitudes, etc.	Add: Standard format reports of transactions; functional budgets; annual reports; some computerization
III. Delegation	Add: Department and college based planning capacities	Add: Delegate management responsibilities to administrative and formalization of management policies and procedures	Add: Assessment of subunit performance on stated objectives	Add: Unit cost analysis; seeking comparative data on costs, work loads, and performance data; computers required
IV. Coordination	Add: System-wide planning, priority and goal-setting	Add: System of coordinating diverse subunit activities and initiating coordinated activities	Add: Prioritizing and assessing competing system-wide objectives	Add: Objectives expressed as programs, (PPBS attempted); simulation models to evaluate alternatives; program costs analysis; extensive computerization
V. Collaboration*	Add: Formal Collaborative planning processes between functional and central administrations	Add: Systems for showing management responsibilities between subunits and central administration; matrix management possible	Add: Assessment of system achievement of combined subunit and central objectives	Add: Decentralized information systems; evaluate policy impact of subunits; evaluate central policy options; extensive distributed computerized systems

* Phase V systems are speculative and have not been formally studied.

Source: St. John (1977)

In addition, there was evidence in the case studies to suggest that management needs emerge in a fashion similar to Maslow's needs hierarchy for individuals (1954); the needs of the prior stage must be met before a new set of needs emerges. The management systems described in Table I, therefore, function as plateaus at which an institution's management system might be most effective. To reach the appropriate plateau, the management needs associated with prior developmental phases must also be met. If a college or university is under managed, which is typically the case in higher education, then unmet management needs may have to be addressed incrementally.

Indicators of Structural Development. Based on a consideration of several variables, ranges for a few measures that indicate or predict phases of development were identified. Table II presents four possible indicators of structural development. These ranges can be used to predict developmental phases. These ranges are tentative, however, and therefore should be interpreted with caution. They could provide a basis for other investigations using this developmental model.

Not all institutions will fall into these expected ranges. Within the case studies we have many exceptions--more than one for each variable. Any given instituion might have two or three out of the four characteristics whithin the predicted range. However, short of developing descriptive histories, these few measures might help the outsider to make an informed guess about an institution's developmental phase.

Rather than use a set of quantitative measures to predict developmental phase, in the long run it might be more appropriate to develop a set of

TABLE II

Possible Indicators of Structural Development for Colleges and Universities

Phases	I	II	III	IV	V*
Enrollment (FTE)	0 → 600	600→1,800	1,800→5,000	5,000→15,000	Over 15,000
Chief Administrators	1 → 5	5 → 10	10 → 15	15 → 25	Over 25
Colleges/ Schools	1	1 → 3	3 → 5	5 → 10	Over 10
Campuses	1	1	1 → 2	2 → 4	4 or more

*Ranges for Phase V based on examination of Missouri data

Source: St. John (1977)

questions about the institution's history, structure, and management. This, in fact, should be an objective of subsequent research in the area.

II. Study of MIS Development

The Missouri Department of Higher Education is currently conducting a comprehensive study of computing at higher education institutions in the state. By 1975, twenty-six states had conducted or planned a state-wide planning effort for higher education computing (Heydinger and Norris, 1977). Missouri had not undertaken such a planning effort and, therefore, it provides a natural setting to examine how computing has evolved in the institutions without the influences of state-wide coordination. The initial results of the study have been analyzed and used to explore the implications of the general management development model for MIS development.

The study results from the public institutions in the state were available for analysis. Five survey instruments were administered to each public institution and each system office; one examined the status of MIS development. The MIS development questionnaire asked about the status of MIS system development in eleven areas:

A. Planning, Management & Institutional Research
B. Financial Management Applications
C. General Administrative Service Application
D. Auxiliary Service Applications
E. Logistics & Relaled Services

F. Physical Plant Operations

G. Admissions & Records Applications

H. Financial Aid Applications

I. Library Applications

J. Other Administrations Applications

K. Hospital Applications

The survey asked about the relevance of computerization for several specific systems in each area, the status of these systems (manual, computerized, combined manual and computerized, under consideration for development, or in production), and the processing mode for computerized systems (batch, on-line, or combined batch and on-line). Institutions were also asked to identify the five top priorities for systems developments and the major limiting factors preventing implementation.

The institutions were grouped into categories according to the quantitative indicators of structural development identified in the prior study. Each category of institutions was then analyzed for the status of MIS development. Two general findings extended the limits of the general model:

1) Although some important differences were observed between institutions in phase I and phase II, which are described in the following section, computerization of administrative systems is considered relevant to phase I and phase II institutions.

2) A fifth category of institutions was also identified in this study. The large state institutions were not excluded from this study as they had been in the prior study of exemplary Title III institutions due to the program's eligibility criteria.

An important caution should be kept in mind when interpreting the findings of this investigation. The entire management system was not examined in this study. The prior study emphasized the inter-relationship of management systems, while the current study examined MIS development only. However, the types of MIS development that have taken place at the Missouri institutions in each phase are, with the exceptions noted above, highly compatible with the general model. The analysis suggests a cohesive framework for decisions about MIS development.

The management information systems at 23 institutions were analyzed to develop the MIS development framework. These included:

-Four phase I institutions (State Fair Community College, Trenton Junior College, Moberly Junior College and Harris-Stowe College)
-Five phase II instituions (Jefferson College, Crowder College, Mineral Area College, Three Rivers Community College, and Lincoln University)
-Four phase III institutions (Missouri Southern State College, Missouri Western State College, Northeast State University and Northwest State University)
-Eight phase IV institutions (Metropolitan Community College System, St. Louis Community Colleges System, Central Missouri State University, Southeast Missouri State University, Southwest Missouri

State University, University of Missouri-Kansas City, University of Missouri-Rolla, University of Missouri-St. Louis)

-Two phase V institutions (University of Missouri-Columbia and University of Missouri System)

III. MIS Development Framework

The use of the five-phase structural development model provides a useful conceptual basis for identifying and grouping the MIS development needs of diverse higher education institutions. It also provides a framework for addressing those needs. The results of the MIS development survey are described below for the institutions grouped by structural development categories. The following discussion considers the results of this analysis in four areas: the applicability of MIS systems, appropriate computer environment, MIS development priorities, factors limiting MIS implementation, and factors encouraging MIS implementation. These areas are summarized in Table III.

Phase I: MIS development for small phase I institutions poses a unique set of problems with a relatively limited range of satisfactory solutions. The key problem is that systems in some key areas, such as finance and student records, are important for the operating systems, but the cost of implementing in-house automated systems are beyond the financial means of these institutions. The solution in most cases is to contract with an outside firm or institution to maintain those automated systems that are needed. A business manager from one of the phase I institutions explained this situation in the following way: "We have a very satisfactory arrangement with a local service bureau to handle our requirements for

TABLE III

MIS DEVELOPMENT FRAMEWORK

	Applicability of MIS Systems	Computer Environment	MIS Development Priorities	Factors Limiting Implementation	Factors Encouraging Implementation
Phase I:	Relevant in limited areas, particularly student records, and financial management	Computer support for automated MIS beyond means of institution	Automation of a few systems as appropriate	Local environment not sufficient to develop and maintain automated systems	Contractual arrangements with other institutions or firms
Phase II:	MIS development likely in some areas (student records and finance) and is considered relevant for systems in most areas	Likely to have some computer development; either small special-purpose machines or part of a network	Initial systems may be planned in several areas with student records, finance, research, and financial aid being priority areas	Numerous problems emerge related to developing new systems (from scratch or adapting old systems); personnel, money and machine access are key problems	Develop computer access (contractual, minicomputer, or network access); identify most important MIS priorities
Phase III:	MIS moderately well developed with mixture of automated and manual systems in most areas; automation is relevant in most areas	Likely to have computing: either CPU mainframe (medium sized machine), mix of small machines, or network access. Instructional computing likely	Initial systems in operation in several areas and specific system development priorities well identified	Personnel for systems development key limitation, money and software limitations; specific hardware needs (disk space, terminals, etc,) a possible limitation	Training students in systems development and programming helps with personnel limits; following overall systems development plan also important
Phase IV:	MIS moderately to well developed; automation relevant for most systems in all areas, operating systems are probable in most areas	Likely to have active computer environment; large mainframe, operate as part of central computer network, or mixture of network and local computers	Automation important in most areas. Priorities include change to on-line systems; modification of existing systems as well as developing new systems	Personnel and money are key limiting factors, especially finding personnel with specialized expertise necessary to modify and update existing systems	Staff allocation and training decisions are critical; individuals with required expertise are limited; training non D.P. personnel to maintain and operate systems also important
Phase V:	Automated systems essential to management of system. Centralized systems and distributed systems in production	Complex computer environments with distributed hardware and distributed data processing in diverse administrative subunits	Refinement and updating of systems already in production. Data base maintenance important factor	Personnel is identified as the most critical problem, finding people to develop and maintain distributed processing systems	Staff training and development; exchange of personnel for training purposes, and develop compatable data definitions and processing systems

administrative financial data and student personnel records. The total annual cost is less than the salary of one trained operator; thus we have no interest in acquiring an in-house computer." These institutions can often afford to operate with entirely manual systems. A summary of the findings for phase I institutions is as follows:

- .MIS developments are relevant primarily in Admissions & Records, Financial Management, and Planning, Management & Institutional Research areas. Operating systems are usually manual or combined manual and computerized.
- .Internal resource and operating demands do not warrant developing and maintaining automated systems on in-house computers. Small (mini) computers may be relevant to instructional programs however.
- .Automation of some systems in the three areas mentioned above may be a priority. Combined automated and manual systems seem most appropriate.
- .The primary limiting factor is that the local environment cannot support operation of in-house computer for automated MIS development and maintenance.
- .The most appropriate solution is to enter contractual arrangements with other institutions or private accounting firms to support the limited data processing needs.

Phase II: Phase II institutions are more complex than Phase I institutions and therefore have a more complex set of management information needs. Some computerization of administrative systems is relevant and in-house maintenance of those systems can be an appropriate solution. Contractual arrangements with an outside firm or institution also

remains a possibility. The two key issues for these institutions are deciding what is the most appropriate hardware solution (small special-purpose machines, network access, or contracts) and identifying most appropriate MIS development priorities. These institutions also need to recognize that the costs of developing and maintaining automated systems may outweigh the benefits in many instances. In short, phase II institutions are likely to be in the initial stages of system automation. A summary of the finding for phase II institutions follows:

- Initial MIS development may already have taken place in a few areas, although most operating systems are likely to be combined manual and automated systems.
- Diverse hardware solutions are appropriate for addressing administrative data processing needs, including contractual arrangements with external firms or institutions, small special-purpose computers, or network access. The appropriateness of each hardware solution needs to be evaluated based on the mixture of computing needs, including the types of instructional and research uses of computing that are likely to be needed.
- Since computerization is relevant in many areas, specific system development needs can be identified in several areas. These institutions need to assess the degree of automation that is appropriate and needed as well as what can be realistically developed.
- A variety of factors limit the extent and speed of system automation, including personnel, software, and hardware costs. Also the extent to which system automation is really needed must be realistically evaluated.

.First identify the appropriate hardware solution within the context of the institution's total computer needs. Second, carefully identify MIS development priorities and recognize that combined manual and automated systems are appropriate in many instances.

Phase III: Phase III institutions are likely to have already faced the problems of initial computer systems development. Automated systems are considered appropriate in several areas. These institutions area also likely to identify specific limiting factors as well as specific system development priorities. Computerization is, by necessity, an important part of the overall administrative management system at phase III institutions. A summary of the findings related specifically to phase II institutions follows:

.Automated systems are likely to be in production in several areas, including Admissions & Records, Financial Management, and Research Planning. Some systems in other more specialized areas -- Library, Financial Aid, General Administrative services -- may also be in production or under development.

.Computerization is an integral part of the overall administrative management system and some sort of computer access is necessary; either local machine or network access is possible. Hardware decisions should also take academic computing needs into account, since computers can also be integral to instruction and research.

.Specific MIS development priorities are likely to be identified by the institution. Most likely priorities are either new automated systems or conversion from batch to on-line processing in areas where systems are already developed.

.Personnel is probably the key limiting factor for MIS development at these institutions. They can lose trained D.P. people either to other institutions or to industry. Hardware may also be a limitation, particularly for campuses trying to convert to on-line systems.

.Key facilitating factors for MIS development at phase III institutions are training students as programmers and analysts and developing methods of evaluating hardware alternatives.

Phase IV: Three types of institutions were included in phase IV: large branch campuses in the University of Missouri, large regional universities, and multi-campus community college systems. It is the most dominant category in the public sector. In spite of the diversity in the type and purpose of these institutions, there were major similarities in their administrative data processing and MIS development needs. All areas of MIS computerization were considered relevant, one or more automated systems were usually in production in most areas, and in most instances system modification and refinement were a higher MIS development priority than creating new systems. Phase IV institutions have highly complex administrative structures with sophisticated management needs. The analysis of the status of MIS development at these institutions follows:

.MIS automation considered important in all areas. Systems are in production in most areas, often using a mixture of processing modes--batch, on-line and combined batch and on-line.

.Computer systems are highly developed. A variety CPU configurations are possible -- use of a central network, operate a central

facility, operate central facility and rely on network, or multiple micro processors with more than one computer facility. Hardware configuration may depend on other computer applications.

.Multiple MIS development priorities are likely, including adding new automated systems and updating, modifying, and refining existing systems.

.Money and personnel are identified as the most critical limiting factor. Development of refined information systems is costly and there are personnel problems such as retaining qualified programmers and analysts.

.Staff allocation and training decisions are critical. When possible staff in functional units should be trained to maintain systems.

Phase V: Phase V institutions are the most complex observable organization structures in higher education. In Missouri public higher education there are two examples: the University of Missouri system, when analyzed as a whole, and the Columbia campus of the University, the flagship campus of the system. They both differ from the phase IV institutions; in addition to centralized MIS systems and facilities, they have other distributed MIS systems and facilities. In the case of the University system, the campuses maintain automated MIS systems in addition to the central administration. There are five computer centers at the UMC campus, at least two of which do extensive administrative data processing. The analysis of the status of MIS development at phase V institutions follows:

.Automation is applicable for almost all systems in each area, for central administration as well as for organizational subunits.

Most systems are in production, updating and modifying systems is common, and processing in all three modes is likely.

.The hardware environment is complex and distributed; there is a mixture of large and small machines.

.MIS development priorities are to refine, modify, and update existing systems or to develop highly specialized capabilities, such as student-flow modeling and induced-course-load-matrix analysis.

.The key limiting factors in the MIS development process seem to be personnel, both for special expertise and for people capable of working with special MIS problems in the different administrative units. Compatability of diverse systems is also a factor.

.Staff training, both for central administrative personnel and operating unit personnel, is an important encouraging factor. Exchange of staff, for training purposes, is a possibility. System compatability can be enhanced by standardizing definitions and operating systems in critical areas.

Conclusion

This paper has proposed a Management Information Systems development framework for higher education institutions that consider MIS needs within the context of the institutions and their internal management needs. If we assume that costs of automation are likely to remain relatively constant during the next decades, with decreases in equipment costs being offset by increased personnel and software costs, then it seems that institutions should base their MIS development decisions on their overall management information requirements rather than on the

hope the automation costs are going to suddenly decline. In this context it is important for institutions to identify the types of MIS developments that are most appropriate, rather than attempting to develop the best possible system. The costs of finding, retaining, and training personnel to develop and maintain basic operating systems is a critical factor for most institutions.

Based on the findings of an earlier study of institutional management systems development, five structural development phases were identified and used to consider the MIS development needs of twenty-three public institutions in Missouri. The results of this analysis suggest that a differentiated approach to the task of MIS development is needed in higher education and that systems design should be considered within the context of the overall management needs of an institution.

References

Balderston, F. E. Managing today's university. San Francisco: Jossey-Bass, 1974.

Chandler, A. D. Strategy and structure: chapters in the history of industrial enterprise. Cambridge, MA: MIT Press, 1962.

Emery, J. C. The coming challenge of campus computation. EDUCOM, 1978, 13, 12-18.

Greiner, L. E. Evolution and revolution as organizations grow. Harvard business review, 1972, 50, 37-46.

Hydinger, R. B. and Norris, D. M. Cooperative computing: a process perspective on planning and implementation. Princeton, NJ: EDUCOM, 1977.

Lee, E. C. and Bowen, F. M. Managing multi-campus systems: effective administration in an unsteady state. San Francisco: Jossey-Bass, 1975.

Maslow, A. H. Motivation and personality. New York: Harper & Row, 1954.

Massie, J. L. Management theory. In J. G. March (Ed.) Handbook of organizations, Chicago: Rand-McNally, 1965.

St. John, E. P. Structure, management, and intervention: final report. A study of selected developing colleges and universities. Cambridge, MA: Harvard Graduate School of Education, 1977.

St. John, E. P. and Weathersby, G. B. Institutional development in higher education: a conceptual framework for evaluation. The development of colleges and universities. Cambridge, MA: Harvard Graduate School of Education, 1977.

Weathersby, G. B. Decision paradigms and models for higher education. Presented at the 48th Meeting of the Institute of Management Sciences and Operations Research Society of America, 1975.

UNIVERSITY OF CALIF.
LOS ANGELES
JUL 20 1979
CLEARINGHOUSE FOR
JUNIOR COLLEGES